2. Foreign Research Reactor Spent Fuel Policy

2.1 Why would the United States take back foreign research reactor spent fuel for permanent storage?

Under the Atoms for Peace Program, proposed by President Dwight D. Eisenhower in December 1953, the United States agreed to supply enriched uranium and research reactor technology to nations that agreed not to produce nuclear weapons. The program sought to promote peaceful applications of nuclear energy and to prevent the spread of nuclear weapons.

The United States made a commitment to take back foreign research reactor spent fuel containing U.S.-supplied uranium because spent fuel containing highly enriched uranium can be used to make nuclear weapons. By making this commitment, the United States hoped to ensure that spent fuel containing uranium of U.S. origin could not be diverted to produce nuclear weapons.

To further reduce the likelihood that spent fuel from research reactors would be used to produce nuclear weapons, the United States adopted a policy in 1978 discouraging use of highly enriched uranium in research reactors worldwide. The United States also began developing replacement fuels that used low-enriched, rather than highly enriched, uranium. Low-enriched uranium cannot be directly used to produce nuclear-weapons-grade material.

In 1986, to encourage operators of foreign research reactors to convert to low-enriched fuels, the United States began taking back foreign research reactor spent fuel containing U.S.-supplied low-enriched uranium.

2.2 If low-enriched uranium cannot be used to produce nuclear weapons, why would the United States take back foreign research reactor spent fuel that contained U.S.-supplied low-enriched uranium?

If the United States took back only spent fuel that contained highly enriched uranium, foreign research reactor operators would then need to make their own arrangements for and bear the costs of disposition of spent fuel made from low-enriched uranium. These costs would make it economically disadvantageous for reactor operators to use low-enriched uranium fuels.

The United States agreed to take back low-enriched uranium spent fuel from foreign research reactors to (1) discourage operators of foreign research reactors from returning to the use of fuels containing highly enriched uranium and (2) encourage operators still using fuels containing highly enriched uranium to switch to fuels containing low-enriched uranium.

2.3 Has the United States taken back any foreign research reactor spent fuel containing U.S.-supplied enriched uranium?

The United States began taking back foreign research reactor spent fuel containing U.S.-supplied enriched uranium in 1958. Spent fuel returned to the United States was temporarily stored and then reprocessed to extract the remaining uranium. The previous U.S. foreign research reactor spent fuel program expired in 1988 for fuels containing highly enriched uranium and in 1992 for fuels containing low-enriched uranium.

In 1994, the United States agreed to take back a limited amount of foreign research reactor spent fuel on an emergency basis. Under this "urgent relief" program, the United States received 252 spent fuel elements from foreign research reactors. The first shipment, which arrived in the United States in September 1994, consisted of a total of 153 elements from reactors in Austria, the Netherlands, Sweden, and Denmark. The second—and final—emergency shipment, of 99 elements, came from Switzerland and Greece, and arrived in October 1995. Both shipments entered the United States at the Marine Ocean Terminal at Sunny Point, North Carolina, and were transported by train to the Savannah River Site, in South Carolina.

In May 1996, DOE announced adoption of a new program to take back spent nuclear fuel from foreign research reactors. By the end of May 1998, the United States had received six shipments of foreign research

reactor spent fuel at the Savannah River Site under the new program. The shipments consisted of a total of 1,371 spent fuel elements, which contained more than 150 kilograms of uranium-235.

2.4 What was the status of U.S. foreign research reactor spent fuel policy between the time the previous program ended and the new program was adopted?

With the 1988 expiration of the program to take back foreign research reactor spent fuel containing highly enriched uranium, DOE began an environmental review of a new program. In 1991, DOE issued an environmental assessment of a proposed extension of the program. Many public comments on that assessment asserted that no decision about long-term policy should be made until completion of a full environmental impact statement.

In 1993, DOE announced its decision to prepare, in cooperation with the U.S. Department of State, an environmental impact statement to evaluate the effects of implementing a new foreign research reactor spent fuel program. On April 21, 1995, DOE issued a draft environmental impact statement. The draft analyzed three alternatives:

- **Alternative 1.**
  Take back and manage foreign research reactor spent fuel in the United States.

- **Alternative 2.**
  Facilitate the management of foreign research reactor spent fuel overseas.

- **Alternative 3.**
  Use a combination of elements from the first two alternatives.

A 90-day public comment period, ending on July 20, 1995, followed issuance of the draft environmental impact statement. During the comment period, DOE held 17 public hearings, which a total of approximately 900 persons attended. In addition to oral comments made at the hearings, DOE received over 5,000 written comments on a variety of policy, economic, and technical issues.

In February 1996, DOE issued the final environmental impact statement. In that document, DOE and the Department of State, in consultation with other government agencies, designated alternative 1—taking back and managing foreign research reactor spent fuel in the United States—as the preferred alternative.

On May 13, 1996, DOE issued a record of decision announcing adoption of alternative 1.

2.5 Why did the U.S. government decide that foreign research reactor spent fuel should return to the United States?

Both DOE and the Department of State concluded that taking back and managing foreign research reactor spent fuel in the United States would best support the nation's nuclear weapons nonproliferation policy. For the following reasons, they believed that failure to manage foreign research reactor spent fuel in the United States could undermine U.S. nuclear weapons nonproliferation goals:

- The United States had not taken back foreign research reactor spent fuel containing highly enriched uranium since 1988, and reactor operators were running out of space to store their spent fuel. Because of regulatory, cost, or time constraints, many operators were, and remain, unable to increase storage capacity at their facilities. For some reactor operators, the most feasible course of action—upon running out of storage space—would be to send their spent fuel offsite for reprocessing. The highly enriched uranium extracted during reprocessing would be placed back in commerce and could in turn be used to produce nuclear weapons.

- Foreign reprocessing facilities lack the capacity to reprocess the newer, low-enriched uranium fuel. Unless reactor operators have the option to return spent fuel containing low-enriched uranium to the United States, reactor operators who switched to low-enriched fuels might convert back to fuels containing highly enriched uranium, which can be reprocessed at foreign facilities.

2.6 What are the major components of the foreign research reactor spent fuel program that was adopted?

The alternative adopted included the following key points:

- The United States will take back up to approximately 19.2 metric tons of spent fuel from foreign research reactors.

- The spent fuel will arrive in the United States over a period of 13 years, ending May 12, 2009. Foreign research reactor spent fuel shipped under this program must be out of the reactor within 10 years of the program's adoption—by May 12, 2006. The additional 3 years are provided to allow the fuel to cool down before shipment.

- With the exception of spent fuel from Canada, shipments of foreign research reactor spent fuel will come into the United States through two military ports—the Charleston Naval Weapons Station, in South Carolina, and the Concord Naval Weapons Station, in California.

- DOE will manage about 18.2 metric tons of the spent fuel at the Savannah River Site, in South Carolina, and about 1 metric ton at the Idaho National Engineering and Environmental Laboratory (INEEL).

2.7 Which countries are eligible to return their research reactor spent nuclear fuel to the United States?

The U.S. foreign research reactor spent fuel program covers the following 41 nations:

Argentina
Australia
Austria
Bangladesh
Belgium
Brazil
Canada
Chile
Colombia
Congo
(formerly Zaire)
Denmark
Finland
France
Germany
Greece
Indonesia
Iran
Israel
Italy
Jamaica
Japan
Malaysia
Mexico
Netherlands
Pakistan
Peru
Philippines
Portugal
Romania
Slovenia
South Africa
South Korea
Spain
Sweden
Switzerland
Taiwan
Thailand
Turkey
United Kingdom
Uruguay
Venezuela

2.8 Why is the United States taking back foreign research reactor spent fuel from developed countries, such as Japan, Canada, and Germany, that have the resources to safely store spent fuel?

DOE and the Department of State evaluated the option of taking back foreign research reactor spent fuel only from developing countries. They decided to include both developing and developed countries in the new program because although developed countries generally share U.S. nuclear weapons nonproliferation goals, they do not necessarily consider it essential to remove highly enriched uranium from use in civil programs. Therefore, the United States was concerned that excluding developed countries from the program could lead to renewed international commerce in highly enriched uranium, which would undermine U.S. nuclear weapons nonproliferation policy.

2.9 Why is the United States taking back spent fuel from foreign research reactors for only 13 years?

The 1996 foreign research reactor spent fuel program has two principal purposes: (1) to recover as much U.S.-origin highly enriched uranium as possible, thereby keeping the uranium out of international commerce, and (2) to allow foreign research reactor operators and the countries in which they operate time to convert their reactors to low-enriched fuel and to make their own arrangements for disposition of the low-enriched spent fuel they subsequently generate. It is not the aim of the program to take back spent fuel from foreign research reactors indefinitely.

The new program is intended to accommodate foreign research reactor spent fuel now in storage and the amount of foreign research reactor spent fuel that DOE estimates will be generated over the 10-year period following adoption of the program. That is, until May 12, 2009, the United States will take back foreign research reactor spent fuel currently in storage and foreign research reactor spent fuel used in reactors on or before May 12, 2006.

A Guide to

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